

Data Quality Monitoring (DQM)

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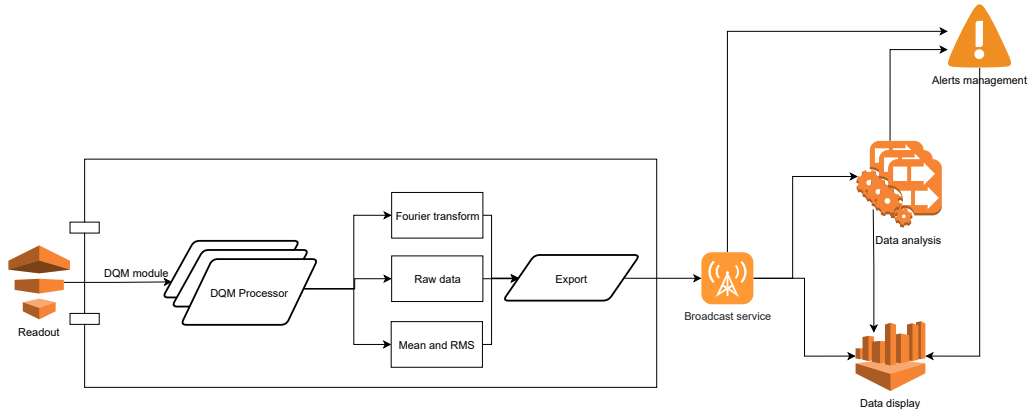


January 18, 2022



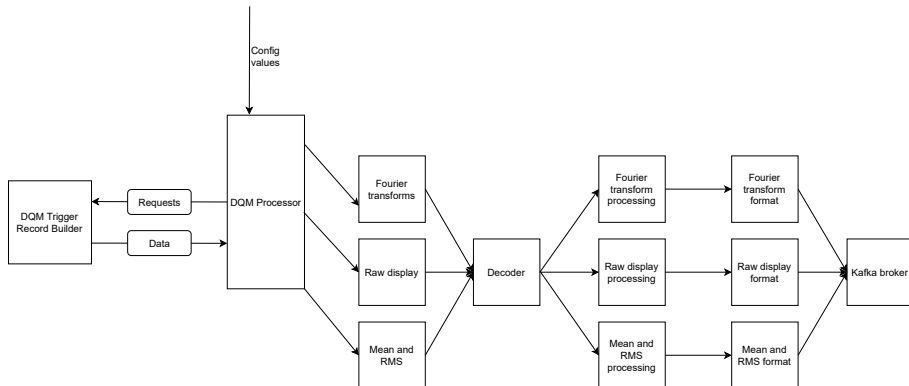
DQM

- Online DQM: processes data in real time and displays the results in a web display
- Project started from scratch around 1 year ago, actual development around 9 months ago



DUNE-DAQ DQM module

- C++, <https://github.com/DUNE-DAQ/dqm>, runs with the rest of the DAQ
- DQM has its own trigger rate, each algorithm requests a configurable window of time from readout every N seconds
- Simple: request data, process it and format the results that are sent to the broadcast service

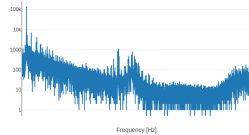


Algorithms

- There are three algorithms supported, their parameters can be changed in the configuration:

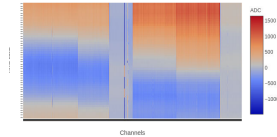
- Fourier transform for each channel, by plane and for all channels

np02_coldbox_dqm0 ft_sums_display_plane_0 updated: 11/20/2021 12:56:38 UTC



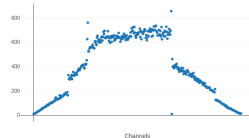
- Raw ADC

np02_coldbox_dqm0 raw_display_plane_1 updated: 11/18/2021 08:26:05 UTC



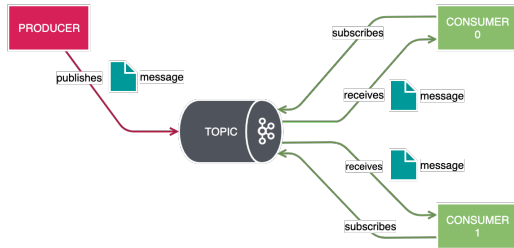
- Mean / RMS for each channel

np02_coldbox_dqm0 rmsm_display_plane_0 updated: 11/20/2021 12:47:32 UTC



Broadcast service

- The broadcast service is based on a kafka broker
- Kafka is an open-source distributed event streaming platform
- Runs in CERN servers, administrated by CERN IT and is also used for DAQ operational monitoring
- Latency and throughput are enough for our needs
- One limitation was found: size of messages has a maximum of 1 MB (by default)



Web display

- Only accessible within the CERN network: <https://dune-dqm.app.cern.ch/>
- Usually what we have in the screen is a 3x3 display with 9 plots
- Plots have features like automatic updating, timestamp of the last update, zoom, hovering the mouse over the plots shows you the values that are being plotted
- The display also has a button to select a date and see what was being displayed at that time

Web display

Dune DQM [Displays](#) - [Variables Management](#) - [Users Management](#) -

Hello j.m.carcell@cern.ch | [Logout](#)

DUNE Data Quality Monitoring platform

First time here? That's were to start:

Data displays

Data displays are a way of representing selected data. It allows you to choose a certain data and decide parameters as its display length or type. You need to be registered as an user to do this action.

Empty panel

Panels are a collection of data displays (formatted data), this page allows you to select data displays and get their updates in real time. You don't want to start from scratch every time? Save your panel and access it any time. You need to be registered as an user to do this action.

Standard Panels

Want a quick start with your panels? When you produce data from a new source, you can generate a default panel with standard data displays. You need to be registered as an user to do this action. You need to be registered as an user to do this action.

Access denied? Ask an administrator you know or yann.donon@cern.ch to give you the appropriate access rights.

Panels

Have you created a panel already, or you want to access any existign one? All panels are listed here, find the one you need and choose "Details". If you have been given the access rights, you may also edit existing pannels, to add and remove data displays. Anyone with an account can view pannels.

Web display: data sources

- All sources that are sending or have sent data (coldboxes and people running the DAQ with DQM enabled) are listed. Multiple sources can be sending data at the same time

Dune DQM

Displays • Variables Management • Users Management •

Hello j.m.carosi@cern.ch! Logout

Index		
Create New		
Source	Description	
global_dqm	Already existing panel Edit Details Delete	
defaultSource	Generate standard panel Edit Details Delete	
np04_vst_rutx0	Generate standard panel Edit Details Delete	
np02_coldbox_rutx0	Generate standard panel Edit Details Delete	
global_dqm	Already existing panel Edit Details Delete	
np04_coldbox_rutx0	Generate standard panel Edit Details Delete	
np04_coldbox_dqm0	Generate standard panel Edit Details Delete	
fake_conf_dqm0	Generate standard panel Edit Details Delete	
np02_coldbox_rutx0	Generate standard panel Edit Details Delete	
epdtdi_test_dqm0	Already existing panel Edit Details Delete	
np02_coldbox_dqm0	Generate standard panel Edit Details Delete	
np04_coldbox_dqm0	Already existing panel Edit Details Delete	
global_dqm	Generate standard panel Edit Details Delete	
file_reader	Already existing panel Edit Details Delete	
test	Generate standard panel Edit Details Delete	
epdtdi_test_dqm1	Already existing panel Edit Details Delete	

- **Generate standard panel** generates a set of plots that we have been used during the past months

Web display: display list

- The list of the displays is customizable, plots can be changed individually

Dune DQM Displays ▾ Variables Management ▾ Users Management ▾		Hello j.m.carcell@cern.ch! Logout
<h2>Index</h2> Create New		
Name	Description	
np04_coldbox_dqm0 default panel	Auto generated panel	Edit Details Delete
np02_coldbox_dqm0	Main np02 panel	Edit Details Delete
epdttdi_test_dqm0 default panel	Auto generated panel	Edit Details Delete
file_reader default panel	Auto generated panel	Edit Details Delete
gloal_dqm default panel	Auto generated panel	Edit Details Delete
epdttdi_test_dqm1 default panel	Auto generated panel	Edit Details Delete
test_dqm0 default panel	Auto generated panel	Edit Details Delete

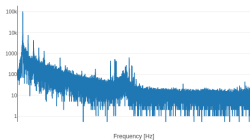
Details Main np02 panel

2021-11-16T21:30:10

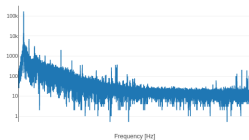
[Jump to time](#)

[Restart from here](#)

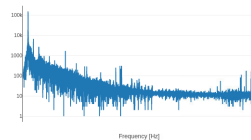
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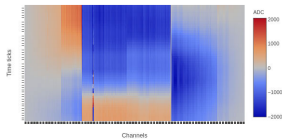
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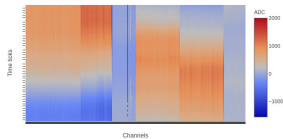
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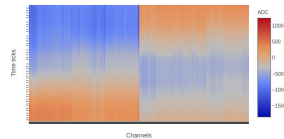
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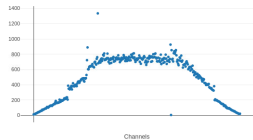
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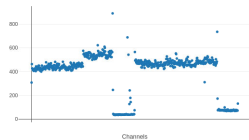
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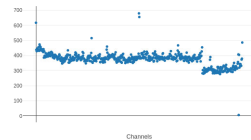
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np02_coldbox_dqm0_rmsm_display_plane_1 updated: 11/16/2021 17:23:37 UTC



np02_coldbox_dqm0_rmsm_display_plane_2 updated: 11/16/2021 17:23:37 UTC



NP operations

- First time DQM has been running on a real system
- Used to monitor the data in real time, particularly the noise levels when changing hardware conditions
- Issues at the beginning that led to crashes due to corrupted or empty data, now fixed
- Feedback used to improve the system:
 - Bugfixes
 - New plot
 - Improvements on the display: timestamps, default set of plots, speed

NP operations

- Displayed in one of the screens of the control room



Outlook

- Keep improving stability and reliability
- Support for other data types
- Develop the analysis part of DQM, is data good? Data quality assessment
- Time-dependent plots
- Deploy the display infrastructure in DUNE-DAQ servers

Summary

- DQM has been running for the first time on a live system, used to monitor the data in real time
- Lots of improvements, performance and stability have increased since the beginning
- Support from the DQM team for the future coldbox and ProtoDune runs
- Small team, mostly working remote

Backup